

BENCHTEST

COMMODORE 64

A home computer or a small business system? Mike Curtis looks at the latest contender to the VIC-20.

The first sight of the Commodore 64 brings an immediate sense of déjà vu; it is almost identical in appearance to the very popular VIC-20, in fact some dealers have been advertising it as the VIC-64.

Viewed in this context the new Commodore machine would look to be a sure winner in the current race to put more and more memory into a small, home computer package. The price of £344.95, however, would seem to exclude competition with the Sinclair Spectrum, Dragon and other similar machines and pit the new Commodore against the BBC, Newbrain and other more "serious" machines, with an educational and small business market in mind.

Commodore itself sees the machine as a low-end business machine, which can be taken home at weekends and can double as a high quality home computer, rather than the opposite. It must be borne in mind though, that a large and successful company like Commodore can afford to be flexible on prices, as when it slashed the price of the VIC-20 not so long ago. In a year or two's time when the VIC has reached its limit the price of the 64 may come down.

Hardware

The Commodore 64 comes in a large multicoloured box like the VIC, and when removed from its packaging material reveals itself in a light brown-grey case 16" by 8" and a maximum of 3" high. Most of the top is taken up by a full size qwerty keyboard. The keys are a chocolate brown colour apart from four function keys to the right of the main keyboard which are a shade lighter. This only leaves room for the Commodore 64 name at the top left and a single LED labelled "power" at the top right. The appearance is attractive and functional and clearly it is intended to blend in well with any office or home environment.

There is a separate power supply in the same type of strong plastic and the same colour as the computer.

A multitude of connectors can be found on both the right hand side and the back. On the side are the power socket next to a small on/off switch, and a pair of 9-pin sockets labelled control port 1 and control port 2 where joysticks and light-pens can be connected. At the back, reading from left to right as you look at them, are a cartridge slot, a small screw head which can be used to select the channel for the TV display, a phono-socket for the UHF TV signal, and two DIN sockets. One DIN socket carries both a composite video output to drive a monitor and an audio signal which can be plugged into a

hi-fi. The other DIN socket functions as a serial port into which can be plugged a VIC printer or a VIC disk drive. Also at the back are two edge connectors; one for the cassette interface and the other for the "user port" into which can be put various interface cartridges such as a modem or RS232. These should be familiar to any VIC or even PET user.

As usual on Commodore machines it is very easy to connect a whole range of Commodore peripherals to the 64, though other peripherals are more difficult. But it should be possible to connect, for example, a daisywheel printer via the RS232 cartridge in the user port slot. The Commodore 64 uses the same C2N cassette unit as the VIC.

Using the Commodore 64

The only thing necessary to get the Commodore 64 working is a 13 amp plug. The leads from plug to power supply and from power supply to computer are reasonably long and another long lead is provided to plug into the aerial socket of your television. The television must be tuned in to the computer's signal as usual, though this did not in my case turn out to be quite at the familiar spot of channel 36 that other machines use.

When all is working properly the screen clears to display a light blue border of about 1" surrounding a darker blue rectangle with the heading COMMODORE 64 BASIC V2 and the message that you have 38911 BASIC BYTES FREE. This to some extent makes nonsense of the claims to offer 64k of memory. Even using Assembly language the Commodore 64 can offer you only 48k of useable memory, but this is no worse than the majority of other machines; indeed it compares quite favourably with the 33080 bytes that MBasic leaves me on my 64k CP/M machine. The lettering and the cursor are in the same light blue as the border, the cursor flashes by inverting whatever is on the screen under it.

Keyboard

The keyboard is laid out almost identically to that of the VIC. At the bottom left is the Commodore key with the Commodore logo, which has several control functions; above is a key labelled RUN/STOP; there are SHIFT, SHIFT LOCK and CONTROL keys also on this side. On the right hand side are keys labelled CLR/HOME, INST/DEL and RESTORE as well as RETURN and another SHIFT; there are two cursor control keys at the

bottom right, one for up and down, the other for left and right. The letter keys carry two graphics characters on their front. The numeric keys situated along the top, carry colours except 9 and 0 which have RVS ON and RVS OFF. The four function keys on the right of the main keyboard are labelled F1 to F4 but also carry a sub-label of F5 to F8. Clearly each key has a number of different functions.

The machine powers up with the keyboard in Upper case/Graphic mode; text is displayed in upper case only, using the SHIFT key gives access to the right hand of the two graphics characters on the letter keys, but the normal shifted characters above the numerals. In this mode CONTROL can be used with numerals 1 to 8 to set the colour of characters displayed to the colour shown on the key; the colours in this main colour set are black, white, red, cyan, purple, green, blue and yellow. CONTROL and 9 will reverse the display. CONTROL AND 0 will restore it to normal.

The mode can be switched to upper/lower case by pressing the COMMODORE key and the SHIFT key together; in this mode upper and lower case characters are available from the letter keys using the SHIFT key as normal, but using the COMMODORE key instead of the SHIFT key gives access to the graphics character on the left of each letter key. The alternative set of eight colours is now available on the number keys, these being orange, brown, light red, grey 1, grey 2, light green, light blue, and grey 3. The COMMODORE and SHIFT keys will switch back to Upper/Graphic mode.

The COMMODORE key is also used when loading cassettes. The RUN/STOP key can be used to stop a Basic program while running and can be used for a warm restart in conjunction with the RESTORE key. The INST/DEL key acts as a backspace-delete or when shifted it will move text one space to the right inserting a space. The CLR/HOME key takes the cursor to the top left corner of the screen and when shifted it also clears the screen.

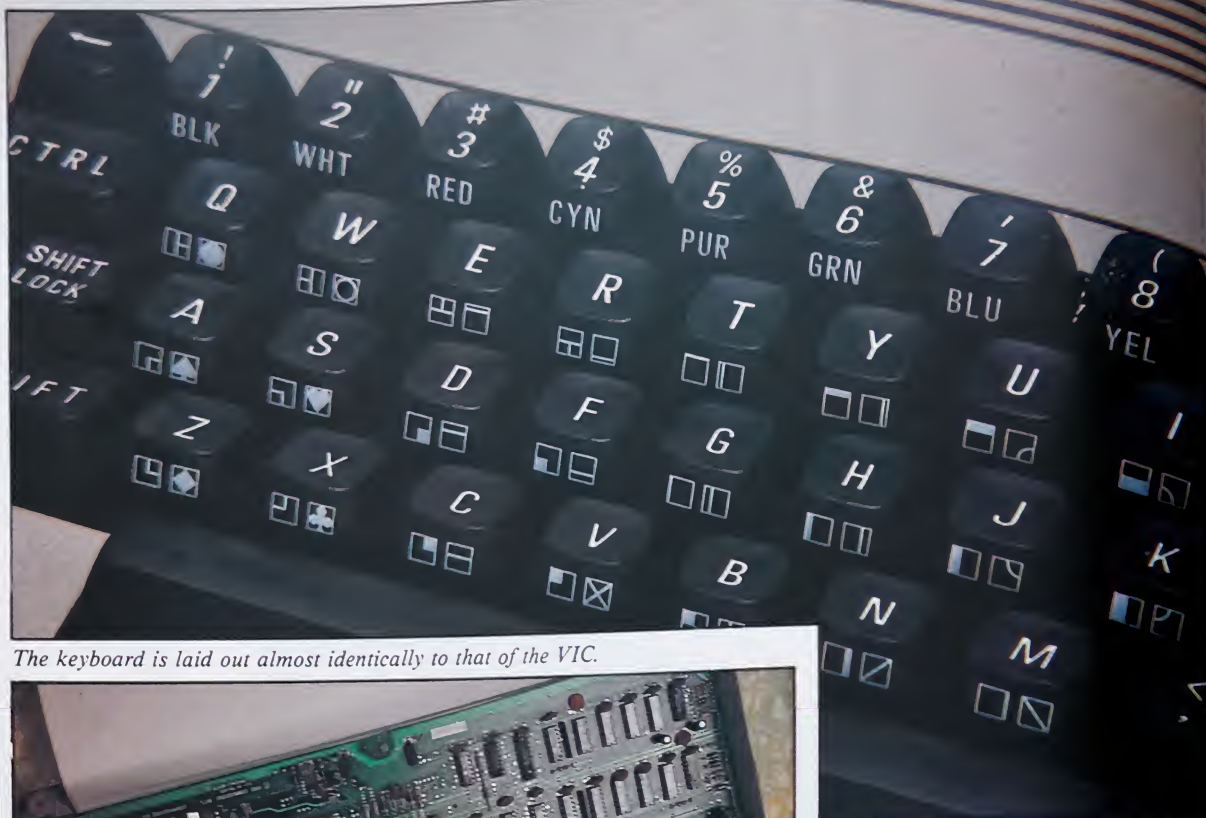
Editing

Full screen editing is available as standard. The two cursor keys, in conjunction with the SHIFT key which is conveniently right beside them, can be used to correct or enter text or graphics characters anywhere on the screen. When RETURN is pressed the contents of the line under the cursor are taken as input as though they had just been typed. This works even if the "line" is in fact longer than the 40 characters allowed on the screen.

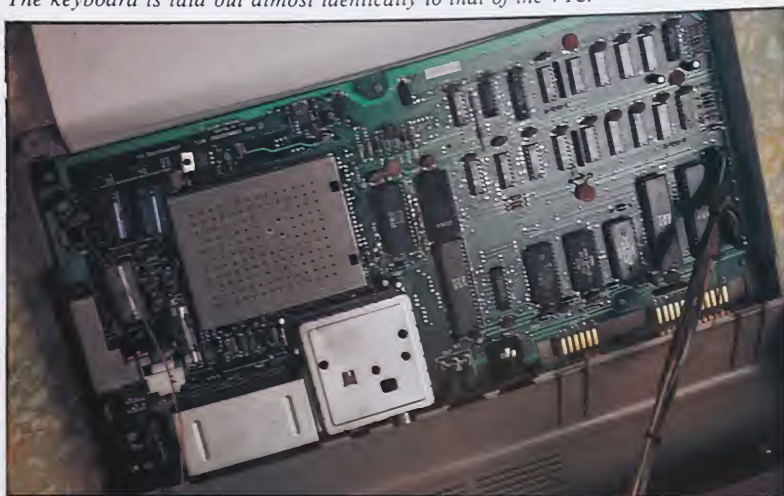
The only keys which repeat are the



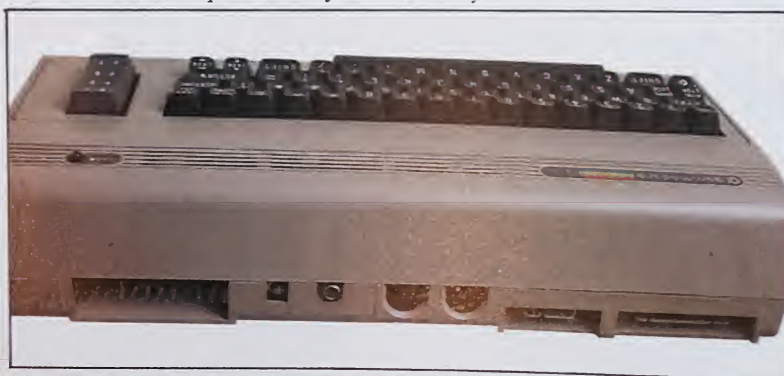
Photography by Ian Dobbie



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Inside the overall impression is of solid reliability.



Most of the top is taken up by a full size qwerty keyboard.

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cursor keys and SPACE. This confused me for a while, being used to auto-repeat on all keys, but I got used to it very quickly. The only snag I found was after making a change and moving the cursor back down using the RETURN key as is my habit; every line is re-entered as it is

passed including READY which is interpreted as READ Y and produces an "Out of Data" error message. The keyboard looks and feels solid and easy to use, though the keys did not "click" positively enough for my taste.

Display

The display was good with edges being quite reasonably sharp and text clear.

There are 25 rows of 40 columns, which is about the most that you can get out of a domestic television. The colours are bright and clear though I could discern a rainbow effect looking close – my television is getting a bit old though, and I have found a number of machines that give better displays when put on a more modern set. I tried the display on a black and white monitor and got a crystal sharp effect. I am surprised that there seems to be no immediate provision for an 80 column display which I would have thought at least desirable, if not necessary for serious business use.

Software

The Basic in this new machine will also come as no surprise to VIC or PET users; it is the standard Version 2 Commodore Basic which does look a bit antiquated now. Variable names can be any length, but only the first two characters are significant. Strings can be up to 255 characters. Integer variables are available using the %, but no double precision limiting real values to 9 digits (10 held internally). There are no control structures apart from FOR ... NEXT, GOTO and a simple IF ... THEN..., and no named procedures.

Input and output can be directed to any of the available ports, so giving easy control of printers, joysticks and other devices. The tape interface is quite standard for Commodore machines, though running at a different speed. I did not have the opportunity to try the disk unit but it should work here as well as it does on the VIC.

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There are two system variables TI and TIS, that give access to a real time clock. TI contains the number of units of 1/60 sec since the machine was switched on. TIS is a 6 character string containing the time in hours, minutes and seconds. It starts at 0 but can be assigned a value to set the time. A further system variable ST contains information on input/output status which can be used to detect errors, though no details of how to do this are given in the manual.

The Benchmarks show that the 64 is in fact a little slower than the VIC but still quite reasonable compared to its main competitors. The major lack however is the almost complete absence of commands to handle the extensive graphic and sound capabilities of the machine. The only way to achieve effects is extensive use of PEEKS and POKES and although the manual goes into some detail about the various memory locations and registers which can be used for these purposes the method is very cumbersome compared to the commands available on say the BBC Micro or the Dragon.

Compatibility

The advantage of retaining the same basic language as the VIC and the PET is, of course, that the machines then become software compatible. It means that the 64 will be able to use not only the vast range of games and home programs for the VIC but also the large quantities of good business software available for the PET. The software will in general not be immediately transferable, because the PEEKS and POKES will be different, as will any USR functions or SYS calls, but it should be fairly easy for a reasonably competent home-programmer to transfer a VIC program and no doubt software to do it will become available soon. Software to make the 64 emulate a "new ROM" PET has already been announced by Commodore. A warning though that the cassette speeds are different so VIC software must be transferred via a disk.

Future add-ons

The faults with the Commodore 64 Basic will also be cleared up, for disk based systems anyway, by another new item of software called "Simon's Basic" which should be available from this April. This will give structured programming, named procedures and direct commands to handle graphics and sound. I would have preferred to see this as the standard. Other projected software includes a number of games and educational programs, obviously carried over from the VIC. But emphasis is given to a new range of software especially written for the new machine including a word-processor, a spreadsheet, a data-management package and a spelling checker as well as other languages such as UCSD Pascal, Logo, Pilot, Comal and Lisp. Even more impor-

tant is the projected Z80 add-on card which will provide the 64 with access to CP/M and unlimited software.

Other projected add-ons include RS232, IEEE and Prestel interfaces and networking capabilities. Speech synthesis is promised for this September and voice recognition for the following January. Dates may well be moveable as always in this business, but clearly the 64 will be the centre of a very sophisticated computer system with access to a very large software base.

Inside

Taking the lid off the 64 means undoing three screws at the front. Then the top comes off with the keyboard which is a separate unit. The lead on the keyboard is not quite long enough to be able to lay top and bottom side by side but it disconnects easily, as does the lead to the power LED.

Inside is a single board occupying the whole space. The processor is a 6510A, a development of the 6502 used in other Commodore machines. Memory comes in the now standard form of 8 x 64k dynamic RAM chips. There are the usual cluster of peripheral control devices and a total of 20k of ROM in three chips. The video circuitry is on its own and screened by a metal case from the rest of the machine as are some of the external connectors. The whole is surrounded by what I can only describe as a sheet of conducting cardboard. This is clearly a professional job as you would expect from a company like Commodore and the overall impression is of solid reliability.

The memory map is not given in the manual though addresses are given for the screen and various control registers. Overall there is a total of 54k of RAM which is available to the user though 16k of this is in parallel with the Basic interpreter so from Basic only 38k is left. There is 4k of ROM on top of Basic and 3k of system RAM. Unlike the Z80 and its relatives all input/output ports will appear on the main memory map so a true 64k is difficult to achieve on 6502/6510 machines.

Graphics

The graphics capabilities of the Commodore 64 are quite extensive. They represent a reasonable compromise between the speed and economy of memory of graphics characters against the convenience and quality of true bit-mapped high resolution graphics with its demands on memory.

There are three ways of using the 64's graphics. The first is by the graphics characters available from the keyboard and through the CHR\$ function; all graphics characters as well as control characters can be entered between quotes in a Basic string assignment. This makes it quick and easy to program many static pictures, such as Bar charts for example. The second way is to use POKES to play around in the video registers to give a 320 by 200 pixel resolution; this is not very easy or convenient but may be made

easier with "Simon's Basic".

The third and most interesting technique is the sprite graphics where high resolution shapes can be plotted on a 24 by 21 grid and can be made to move around the screen, enlarge and diminish through values POKEd into various sprite registers. They can be made to pass behind one another and collisions can be detected. Up to eight sprites can be active at any one time. Once again the process of defining and manipulating sprites is quite complicated from the standard Basic. The sequence that must be followed to define and use a simple sprite is first to plot the required shape on a 24 across by 21 down grid using graph paper. Each row of 24 on/off bits is interpreted as 3 bytes and the resulting 63 8-bit binary numbers converted to decimal. These 63 data values are transferred to a block of 63 bytes somewhere at the beginning of memory – the number of this block (in multiples of 63 from 0) must be POKEd to a particular register so that the sprite knows where to get its data. The starting address of the video registers is at 53248 and the number of the register is added to this base address to get the address of the register into which the appropriate values can be set.

Motion is achieved by updating the X and Y co-ordinates. The user must be able to convert between one or more '1's in an 8-bit binary pattern representing one or more sprites being manipulated into a decimal number. Collisions can be detected by PEEKing at registers and determining whether or not particular bits have been set. Sprites can be any of the 16 colours or a special multi-coloured one. One problem arises with the use of an 8-bit register to hold the X co-ordinate since this gives a maximum value of 255, whereas the screen width is 320. To move past the barrier needs the setting of the Most Significant Bit for the appropriate sprite in register 16, which effectively makes the X co-ordinate into a 9-bit number and hence up to 511. The sprites are not particularly fast when used from interpreted Basic but speed should increase when compiled Basic or Assembly code is used to give some good games effects.

The normal characters can be POKEd into the screen, which occupies 1000 bytes from 1024 in a straightforward row by row one byte per character grid, but the character codes to be POKEd are not ASCII. A parallel 1000 bytes starting at 55296 controls the colour in each character position which can be again be set by POKeing the appropriate colour code into the correct place.

Sound

The sound generation facilities are another strong feature of the Commodore 64. Again the standard Basic leaves you to set all the various features of a sound by POKeing into various registers but the facilities are excellent and the quality good.

The first thing to note is that the sound actually comes from the television set;

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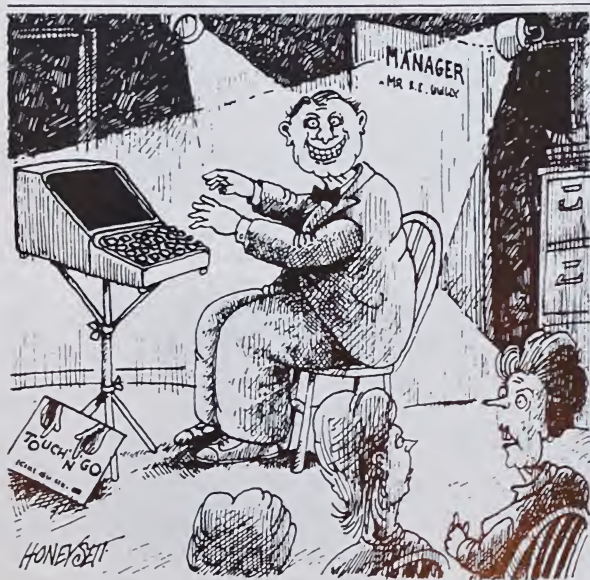


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there is no in-built loudspeaker. An audio output is available from the same connector as the video output and enables the sound to be played through an amplifier or a domestic hi-fi. It has been claimed that the sound produced by this machine is as good as some synthesisers, I think this is overstated but the quality is as good as I have heard and the range of settings available is quite staggering.

There are three voices occupying a range of registers from 54272 to 54292 inclusive. It is possible to control for each of three voices: volume (a range of 0-15), attack/decay and sustain/release, frequency, waveform, and pulse rate. Values are given in the manual to play notes over 9 octaves and in a variety of voices ranging from piano to trumpet as well as suggestions for found effects. A piano keyboard is one of the add-on units that should be available soon and that could be interesting if backed up with suitable software.

Documentation

The Commodore 64 comes with just the one 'User's' manual which purports as usual to be both a manual for the machine and an introduction to Basic (and binary arithmetic in this case). It does not really succeed but it could be worse. On balance it is much better than many Commodore manuals in the past. My main criticism is

its small size: the reader is pointed towards the 'Programmer's Reference Manual' for further information but this has to be obtained separately. There are some major omissions from the 'User's Manual', notably the only mention of the function keys is to point out how useful they could be, but nowhere does it mention how to use them! I would think that the 'Programmer's Manual' was necessary enough to warrant inclusion as standard.

To emphasise the dual nature of the Commodore 64 the manual seems to assume that many users will be attaching a disk drive so all instructions for loading and saving programs, and for the use of data files, duplicate for disks and tape.

The manual gives a number of useful examples to illustrate the use of Basic and the various facilities of the machine. Tables are included in the appendices for the video control and sound registers and clear instructions on how to POKE to the screen and the screen colour area.

Although it is quite well written the manual does seem to fall between two stools; the novice may well find some of the tables and the binary arithmetic a bit daunting and require something which takes a bit more time over their use. On the other hand a more experienced user would feel a bit restricted by the absence of the Programmer's Manual and so would need to buy it straight away.

Conclusions

The Commodore 64 is what you might

expect from a major manufacturer like Commodore: a professional high quality machine with a guaranteed large software base. There is nothing startlingly new about this machine, in some ways it is a marketing ploy like the new Apple IIE: upgrading a well-tried and proven architecture with the most modern technology. This allows the manufacturer to launch a product which will compete on equal terms with the new machines while armed with peripheral attachments and software already available. That has to be a recipe for success. The VIC printer, joysticks, disk drives and others will all work on the 64, new sophisticated add-ons designed for this machine will be available shortly.

The machine is already proving very popular in America, and Europe has always been a better market for Commodore than for the company's major competitors so there is no doubt whatsoever that the 64 will sell well and have a major effect on the market.

It is a good machine with all the facilities that a home user would require, although I have my doubts as to its useability as a business system, but this will depend very much on the software. There are machines around now or coming soon which will overtake the Commodore 64 in specification but the 64 will have the same advantage that the VIC enjoys, namely that it along with its peripherals and software will be available in large numbers on every high street.

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